Combinatorialism Revisited[1]

1.

The object of this paper is to argue once again for the combinatorial account of possibility defended in earlier work (Armstrong, 1989, 1997). But there I failed fully to realise the dialectical advantages that accrue once one begins by assuming the hypothesis of logical atomism, the hypothesis that postulates simple particulars and simple universals (properties and relations) at the bottom of the world. Logical atomism is, I incline to think, no better than ‘speculative cosmology’ as opposed to ‘analytic ontology’, to use Donald Williams’ terminology (Williams, 1966, p.74). It is, however, not an implausible hypothesis given the current state of quantum physics. More important for our purposes here, the strictly combinatorial theory that flows rather naturally from the atomist metaphysics shows some promise of continuing to hold (perhaps with a little *mutatis mutandis*) in a world that is not an atomist world.

Let us begin by considering a world that is a particularly simple sub-species of a logical atomist world: a world of monads. Each simple particular is to instantiate an indefinite number of simple *monadic* universals, any number from one to infinity. Such a world can be modelled by a spread-sheet, perhaps an infinite one in both directions, though physicalists will have hope that the number of simple properties is not too long a list. The columns are the simple particulars, *a*, *b*, *c*,….The rows are the simple monadic universals, F, G, H, …. (If the poison you choose is the tropes, then substitute members of equivalence classes of tropes. This should not disturb the scheme unduly. If you like neither universals nor tropes, do the best you can, and good luck.)

a	*b*	*c*	*d*	*e*	→
F √	√		√		
G	√	√		√	
H √		√	√		
J	√		√	√	
↓					

[1] This paper was published in French as “Theorie Combinatoire Revue et Corrigée” in J-M. Monnoyer (ed) *La Structure du Mond: objets, propriétés, états et choses*, Paris, Vrin, 2004, pp.185-198. It appears here with minor corrections.

Columns and rows intersect. Some of the points of intersection will be filled, represented by ticks, say, and some will be empty. The filled points of intersection will represent atomic and monadic *facts* (as Russell and Wittgenstein would have said) or atomic and monadic *states of affairs*, as I prefer to say. (Or, if negative states of affairs are countenanced, the filled points will be the totality of *positive* atomic and monadic states of affairs.) In a philosophy of tropes, the points of intersection on the sheet really are, metaphysically, points of intersection. In Donald Williams' scheme set out in his paper 'The Elements of Being' (first published 1953), for instance, we find an intersection of the bundles of tropes that constitute particulars and equivalence classes of exactly representing tropes that are his substitute for universals.[2] Don Baxter of the University of Connecticut has recently persuaded me that, given genuine universals, it is also plausible to think of particulars and universals as really intersecting. Particulars and universals participate in each other, to use Plato's language. I have hopes that this is the solution to the vexed problem of how particulars and universals stand to each other when a particular instantiates a universal. But this tantalising possibility will not be explored further in this paper[3]. Notice, however, and some will think this a serious disadvantage, that the intersection can hardly be a purely mereological one. The particulars that instantiate a universal can hardly be mere mereological parts of the universal. Nor, I think, can the properties of a particular be mere mereological parts of the particular.

Our focus here, instead, is on the unfilled points of intersection of column and row. Two questions arise. *First*, there is the question of their ontological status.

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[2] In Williams' scheme the rows are classes of tropes unified by the equivalence relation, which is also an internal relation, of exact similarity. A particular is thought of as a mereological sum of tropes, but one further unified by the external relation of occurrence, the 'limiting value' of the 'numberless distances and directions which compose locations in space and time' (p.79 in Williams, 1966).

[3] Since intersection is, necessarily, a symmetrical relation, the distinction between particulars and universals is on this theory apparently threatened, something that might have given pleasure to Frank Ramsey (1925). I believe that a fundamental distinction between particulars and universals can still be made out, but again I will leave this aside here.

There seem to be three ways to go on this matter. (1) They are truly nothing at all, mere holes in being, in the striking phase of Yuri Balashov[4]. (2) They are negative states of affairs or facts, negations of the positive states of affairs. (3) An intermediate position: we ought to reify some or all of the ‘holes’ as possibilities of positive states of affairs, mere possibilities but ones that must be recognised in our ontology, whether in this or other worlds.

Second, there is the question of the modal interconnections of each point of intersection, filled or empty. For instance, are there are empty intersections that are necessitated, metaphysically necessitated, to be empty because some other points are filled, for instance, an x that cannot be a G because it is F? And are there intersections that cannot be empty because other points are full, for instance an x that must be G because it is F?

The question of the ontological status of the unfilled holes is very important, and it is controversial. But it is not my major interest in this paper, and so I pass over it quickly. I favour something close to the radical ‘holes in being’ approach. I do accept that truths of the form ‘it is not the case that *a* is F’ have truthmakers, but I deny that these truthmakers are negative states of affairs. Given a simple spread-sheet world of the sort described, my idea is that all we need is one of Russell’s general facts: the state of affairs that the positive states of affairs, the ticked intersections, are *all* the atomic monadic states of affairs. This will be the only truthmaker needed for the blankness of the blank intersections. Thus there is one truthmaker here, though it involves a long, perhaps infinite, conjunction of positive states of affairs, the conjunction of ticks. But it is perspicuous from the spread-sheet that this general fact (totality state of affairs) will be the truthmaker for indefinitely many negative truths.

But now the question is whether ticks at certain intersections – the contingent states of affairs as I take them to be – can ensure blanks, or ensure that there are no blanks, at other intersection points. I introduce here the concept of *modal role*. The phrase is meant to recall David Lewis’ well-known notion of

[4] See his very interesting (1999).

causal role. Modal role attaches in the first place to universals, though it is extendable to less well-behaved, less fundamental, properties and relations, such things as colour-properties. But it attaches to universals and other properties in virtue of the states of affairs in which the universal appears. The states of affairs, either singly or in conjunction with further states of affairs, may necessitate or may exclude certain further states of affairs. The presence or absence of further universals in the structure of the original state of affairs may further affect the states of affairs it necessitates or excludes. (Such cases do not come up in our monadic spread-sheet, because only one simple monadic universal is found at all intersections.) These patterns constitute a universal's modal role. The full characterisation of modal role may require reference to merely possible states of affairs. The potential complexities involved are not dissimilar to the complexities covered by the phrase 'causal role'.

Here now is my speculative thesis for this spread-sheet. For these simple monadic universals, no combination of ticks and blanks necessitates any further combination of ticks and blanks. (Notice that I am not talking about structural universals that are constructs from these simples.) This, I take it, is the Tractarian thesis of Independence for this sheet. Or putting it in terms of modal role: these universals have, with respect to each other, the *null* modal role.

A minor but important qualification. I do maintain that for each row there must be at least one tick. This is the rejection of uninstantiated simple universals. I also maintain that for each column there must be at least one tick. This is the rejection of completely bare simple particulars. I will not be concerned here to argue for these theses. But, my present thesis is, with these minimal restrictions, any filling in of the spreadsheet is a metaphysical possibility. This is my radical Combinatorialism for this restricted world.

How is this thesis to be argued for? That is the business of this paper. I believe that compelling, though not apodeictic, reasons can be given. I begin by arguing for a certain view of universals (already put forward in my 1997 book). I think my arguments are still strong even if this idea is incorrect. But if it is correct, that seems to strengthen the current enterprise.

Consider all the simple monadic universals, the rows of the spread-sheet. What constitutes the difference, what individuates, any of these universals from any other in this restricted class of universals? I suggest that there is no other differentiating factor than this: They are barely numerically different from each other. Their quiddity, as we may put it, their whatness, is no more than this. As a parallel, consider two or more particulars that are exactly alike, which, *pace* Leibniz, I take to be a genuine metaphysical possibility. In such a case the particulars are barely numerically different from each other. Their haecceity, their thisness, is no more than that. I hold that we should say the same about simple monadic universals. An extra, ineffable, quiddity is not required in universals any more than an extra, ineffable, haecceity is required in particulars.

One might worry that such a doctrine of the individuation of simple properties destroys the distinction between them and simple particulars. A ghostly cheer from Frank Ramsey, perhaps. I trust that this is not so, but will not elaborate here. We might think of these classes of universals as lying along a dimension orthogonal to the dimensions particulars lie along, as indeed the spread-sheet model suggests. Why should bare difference be difference in particulars alone?

Back now to the spread-sheet. How could it be that filled, ticked, intersections, the actual states of affairs, should with absolute necessity exclude or necessitate further fillings? Note first that there is a special problem with exclusion. If this is to be an ontological relation, as opposed to a relation between propositions where the truth of one proposition mandates the falsity of the other, then what can the relation hold between? Between a state of affairs and *nothing*? That way Meinongianism lies. If this is rejected, one who postulates exclusions will have, I think, to embrace negative states of affairs, at least in those intersections where some positive state of affairs enforces the emptiness of that intersection. This is an ontological cost, which not everybody will be willing to pay. But it does supply the missing term, and enables exclusion to be reduced to a form of necessitation, one where the necessitated term is a negative state of affairs, as it might be: its not being the case that *a* is G. The modal role of the excluding universal has become more complex.

But there is a more general difficulty in moving beyond a null modal role for the universals in the spread-sheet we are contemplating. What can there be about a certain universal, F say, that when it is instantiated by *a* it necessitates that *a* is not G, and/or that it must be H, while not standing in this relation to *a*'s further properties J and K?

Remember that F, G, H, J, and K are all supposed to be simple, atomic, properties. What is there about them that serves as an ontological ground, as a truthmaker, for these differences? There appears to be no room, as it were, in the simple properties, so that they can sustain quite different modal relations to different properties. If, in addition, you go along with the idea that F, G, H, J, and K are no more than barely numerically different from each other, any difference in their modal role seems staggering. And even if this account of numerical difference is rejected, it is still very hard to see how these differences in modal role are to be sustained. I do not put this forward as an apodeictic argument, but I do suggest that it is rather persuasive.

The following objection can, and should, be made to my argument. The objection starts by pointing out that simple monadic properties do have to be credited with the property of *being monadic*. You can see that this is so when you consider that a monadic property, simple though it may be in other respects, does have to be distinguished from a simple polyadic property, say a dyadic relation. It is further distinguished from a particular by being a universal. Finally, it is simple as opposed to being complex. We might, following Markku Keinänen (University of Helsinki) call these internal properties (the parallel is with internal relations) of our monadic simple universals. Others might prefer to speak of essential properties.

This conceded, why might we not make the particular, perhaps idiosyncratic, modal role of one of these universals a *further* property that the universal has? It will be no more than an additional internal or essential property of the universal.

I have no conclusive argument against this suggestion. All that can be pointed out is that, unless every universal had the very same non-null modal role, each different modal role will yield universals that are not merely numerically different from each other but differ in their nature. Such universals could hardly be called simple. But if a defender of different modal roles accepts this point, my only further argument is one from simplicity. In classical fashion, I am suggesting, the complexities of the surface of the world, here its modal complexity, are derived from a simple underlying scheme. And simplicity should be sought, even where we distrust it. What I am offering is certainly a 'speculative cosmology' in Donald Williams' sense, but, I say, none the worse for that.

2.

Let us move now from the monadic case to consider simple dyadic relations. Here the matter becomes more complicated, the spread-sheet will have to be more sophisticated, but we may hope that the same conclusions can be upheld. A preliminary matter. We need in the first place the distinction between internal and external relations and, following on this, the thesis of the ontological innocence of internal relations. Internal relations, as I use the phrase, are ones where, given the mere terms, the relation is necessitated. Bare identity and diversity are internal relations. Again, given that *a* has property F and *b* has property F, then *a* and *b* resemble one another, at least in some degree. This relation of resemblance is necessitated (one can perhaps say 'supervenes'), and so is internal. Such relations, I maintain but will not argue here, are no 'increase of being' over the terms. (Of course, to say that internal relations are no increase of being is not to say that they do not exist.) Relations that are not necessitated by their terms are external. By making 'external' the mere negation of internal we allow for cases of external relation that involve an admixture of internality. Thus the relations of *giving birth to* is external, but it demands that it terms be animals, and this resemblance in being animals is an internal relation. The relations involved in polyadic but atomic states if affairs are all (purely) external[5] relations. Internal relations do not generate states of affairs. The truthmakers for truths about them are just the terms. (I think that the same can be said for internal properties. Their truthmakers are the entities that have the internal properties.)

So let us consider the external dyadic relations. It would be nice to isolate *simple* external relations; then produce an analogue of the simple spread-sheet that we postulated for the monadic cases; and finally hypothesise that these relations have a null modal role. Can we do this? As one might expect, the matter is more complex than in the monadic case. Dyadic relations have all sorts of different, and in some cases incompatible, internal properties. They are symmetrical, asymmetrical, non-symmetrical, transitive, reflexive, and so forth. If these properties attach to relations contingently only, then there is no problem. Modal role is not concerned with contingencies, except negatively. But if external dyadic relations *necessarily* have such properties, with different relations having incompatible properties, then the situation becomes problematic, and the way ahead unclear.

What would simplify the situation advantageously would be if it could be argued, or at any rate made plausible, that the simple and ultimate dyadic relations are, of necessity, symmetrical. The advantage is that in this case it seems we do not have two relations, one running from *a* to *b*, the other from *b* to *a*. What we have is no more than *one* relation which our symbolism permits us to represent in two different ways. Take as an example, unlikely to be simple and in any case locked into the Newtonian paradigm, of *being a mile apart*. If *a* is a mile away from *b,* then, of necessity, *b* is a mile away from *a*. The obvious way to explain, pretty much explain away, this symmetrical necessity, is that here '*a*R*b*' and *b*R*a*' are no more than notionally different ways of speaking of just one state of affairs. Employ the device of plural

[5] I have recently come to suspect that the term 'external' is not quite satisfactory here. But this is not the place to develop my reservations.

reference: *they*, *a* and *b*, are related by R. Here '*a* and *b*' involve no order, although the symbolism still appears to give them an order.

Flowing from this, as has been pointed out by Cian Dorr (2004), is a simplification of the theory of states of affairs for such relations. On anybody's view, given *a* and F, and given that they are the constituents of a state of affairs, then that monadic state of affairs must be *a*'s being F. Dorr points out that, given necessarily symmetrical and dyadic R, and *a* and *b* as its terms, then there is again just one state of affairs that they form: *a*'s having R to *b*. (Contrast a non-symmetrical S and *a* and *b*. We could have at least one, and perhaps two, of *a*S*b* and *b*S*a*.)

Dorr goes on to argue, a difficult argument that I do not clearly grasp, that this result can be generalised to apply to all fundamental relations, whatever their -adicity. Given such relations and their terms there is only one state of affairs they can form. This, as he says, brings states of affairs closer to mereological wholes. (Given mereological parts, there is only one mereological whole that can be formed from them.) Closer perhaps, but states of affairs remain different from mere mereological wholes. If *a* is F but not G, which is instantiated elsewhere, both *a*+F and *a*+G are mereological wholes (the latter rather an uninteresting one), but, assuming negative states of affairs are ruled out, only *a* and F make up a state of affairs.

But even without the argument, Dorr's speculation is an attractive one, at any rate if you are looking for a combinatorial theory. The headings of the relevant spread-sheet become simple enough. Take a dyadic case. At the top, instead of, or in addition to, *a*, *b*, *c*,... we have the class of *a* and *b*, the class of *a* and *c*, the class of *b* and *c*,... and so on for every unordered pairwise combination of the simple particulars. (It seems clear that classes rather than mere mereological wholes are what is needed.) Along the side we have listed each different simple and necessarily symmetrical dyadic relation. The filled intersections on the sheet are each a single atomic dyadic state of affairs. The unfilled intersections on the spread-sheet are the *mere* possibilities.

	{*a, b*}	{*a, c*}	{*b, c*}	→
R	√		√	
S		√	√	
T	√	√		
↓				

Each row must contain one tick, that is to say each dyadic universal must, like its monadic counterparts, have at least one instantiation. But notice that it is not necessary that each unordered pair be related by at least one of the relations. There can be columns without ticks. On the supposition that the fundamental relations hold between particulars that are in some sense ‘adjacent’ there may well be a majority of columns without ticks. But all combinatorial possibilities – all combinations of ticks and blanks – will be possibilities. No patterns of fillings or blanks are ‘dictated’ by other fillings and blanks. For instance, there cannot be any simple and necessarily symmetrical R, such that it is necessitated (or excluded) that if xRy and yRz, then xRz. The appropriate modal role, so our hypothesis goes, is once again the null role.

Emboldened by this, let us attempt a critique of the notion of simple dyadic universals that are not symmetrical. We shall, of course, not be expecting any certainty. Let us first consider dyadics that are necessarily asymmetrical. Asymmetrical relations that have some claim to be both fundamental and necessary are *being before in time*, and the causal relation.

If presented on a spread-sheet, necessarily asymmetric dyadics would require each pair of simple particulars to be presented twice as ordered pairs <*a, b*> and <*b, a*>. Each of the sub-boxes, as we may call them, would be such that either they are both empty, or, if one is ticked, its companion cannot be ticked. The modal role of these asymmetrical relations would be very similar to the alleged incompatibility of fundamental properties. The objection brought against incompatible properties can therefore be brought against these relations. To avoid a Meinongian analysis of the ontology of the ‘blanks by necessity’, a necessitation relation between states of affairs must be substituted for the exclusion relation. That is to say, the excluded, non-existent, state of affairs must be transformed into an existent negative state of affairs, the negation of the excluded positive state of affairs. Given that *a* has (asymmetrical) R to *b*, this will necessitate that *state of affairs* – (*b*R*a*). And the following will have to be added. Where neither xRy nor yRx holds between two simple particulars, but it is possible that one or other of these states of affairs should obtain, there will be the *possibility* of negative states of affairs. At least to those who accept positive states of affairs, but who recoil from negative states of affairs, this should be a powerful *ad hominem* argument against allowing fundamental asymmetrical relations.

To this may be added a critique of the idea that temporal precedence and causality are really asymmetrical of necessity. I have already discussed these cases in *A World of States of Affairs* (1997, Chs.9, 14.4). Considering time first, there seems to be the possibility of circular time. Two different points in the circle then precede each other. Gödel argued that this was even physically permitted by the equations of general relativity. It is to be noticed that even with circular time allowed we would apparently have a necessary transitivity, which would still move us away from a null modal role. But the atomic particulars envisaged by logical atomism would appear to necessitate ultimate units of time, whether punctual instants or granules of duration. It is then not obvious that temporal atoms have to be linked in chain-like structures where transitivity is preserved. New physical thinking about spacetime that springs from the speculative parts of quantum physics – string theory in particular – has presented us with the idea of very strange 'shapes' to spacetime. Indeed, it seems to present us with the idea that spacetime is not a fundamental entity, but instead the 'manifest image' of some deeper hidden structure. Why not the possibility of a strange transitivity-busting, shape for the temporal dimension?

Causation raises rather special problems for the combinatorialist, at any rate if one wants, as I want, to defend genuinely singular causation. It cannot be just a relation between particulars considered in independence of their properties, but neither can it be just a relation between universals in independence of the particulars that instantiate them. The latter might well give us the *laws* that govern the singular causal relations, but the laws cannot constitute causality all by themselves. This leads me to think that causality is a relation that holds between states of affairs, between the filled intersections in our spread-sheets. (The fact that the terms are complexes seems no bar to the relation that holds between them being simple.) Combinatorialism then demands a higher-order spread-sheet, where both column and row contain states of affairs or conjunctions of states of affairs.

If causation is necessarily asymmetrical or necessarily transitive this, of course, would contradict the combinatorial idea of a null modal role. I argue against asymmetry first. I suggest that causal loops, as well as temporal loops, are not impossible, thus robbing the causal relation of its apparent necessary asymmetry. Indeed, if temporal loops are possible, might not the temporal loop be also a causal loop, each segment being the total cause of the succeeding segment? A causal loop might involve as few as two atomic causal relata: *a*C*b* and *b*C*a*. (Here *a* and *b* are states of affairs. I assume that a state of affairs cannot have the causal relation to itself.) This might require backwards causation, but this is now widely accepted, at least as a possibility. In any case, consider two upright tiles or playing cards that lean against each other and so cause the other to stay in place. We do not in fact believe this to be simultaneous causation – earlier time-slices of each object are acting on later time-slices of its partner. But the causation *appears* to be simultaneous. This is some argument for the conclusion that it is *possible* that it is simultaneous. If it is possible, we would have the possibility of a causal loop, and one without backward causation.

The apparent necessity of the transitivity of causation can also be worked round. If *a* causes *b* which causes *c* it seems wrong to say that *a* causes *c* in the same sense in which it causes *b*. (Unless *c* is overdetermined, being caused both by *a* directly and by *b* which is in turned caused by *a*.) The fundamental causal relation, a combinatorialist can say, is that holding between 'causally adjacent' states of affairs. It is only the non-fundamental *ancestral* of that relation which is transitive.

It remains to consider dyadic relations which are neither symmetrical of necessity nor asymmetrical of necessity. If *a* moves towards *b*, then *b* may or may not move towards *a*, so *moving towards* is such a relation. The first thing to note is that, unlike the asymmetrical case, such relations do not seriously threaten a permissive combinatorialism. Each intersection would again have to be divided into two sub-boxes, yielding four possibilities: both boxes filled, *a* and *b* move towards each other; *a* moves towards *b* but the second box is empty; *b* moves towards *a*, but the first box is empty; both boxes are empty. Of course, *moving towards* is not a very impressive candidate for a fundamental relation. It does not seem to be a *pure* external relation: the relation depends on the states of motion of the related objects, plus the direction of those motions. And even if pure, it is unlikely to be simple. But if there are fundamental non-symmetrical relations, they, it seems, could be accepted as a particular type of dyadic relation and could be accommodated by an extension of the spread-sheet model.

Such fundamental non-symmetrical relations are nevertheless somewhat unattractive. We would have to abandon Dorr's appealing hypothesis that for all fundamental polyadic universals the -adicity of the relation, all by itself, determines the form of the atomic states of affairs into which these relations enter.

3.

The 'spread-sheet world' that I have been trying to adumbrate, a world close to the *Tractatus* world, and in many ways inspired by it, is a speculative hypothesis. It is a hypothesis of a very abstract sort. The structure it presents may underlie the scientific image of the world that is struggling to emerge. You might think of it, if this is not *hubris*, as a philosophical image, an ontology, that lies as deep below the scientific image of the world as the current scientific image lies below the manifest image of the world that ordinary life presents us with.

The hypothesis would be, though, that given the full spread-sheet and its ticks, we would be given the world. All the complexity of the world, including all the properties and relations that are not modally null at all, would be, in the deepest, in the last, analysis, nothing but a spread-sheet world. That the world has this nature would be, I suppose, a necessity, thought of course a necessity that could only be established, *a posteriori*. Perhaps, though, it could be falsified, or at least put in serious doubt, by the production of genuine, instantiated, universals that are plausibly simple and plausibly not modally null.

What I think is not a particularly strong argument against the scheme is just to point to the fearsome complexity that the world presents on its surface, including its apparent modal complexity. The properties and relations that we work with in ordinary investigations, including scientific investigations, seem modally saturated – have complex modal properties – in many ways. Think of the way that the modally complex scheme of determinables and determinates (colour and its shades, for instance) seems to be an organising scheme that has almost universal application. Think of the complex modal relationships that hold between so many quantitative concepts in so many disciplines. Think of the way structures involve other structures in complex ways, where the relations of the methane molecule to its four carbon and one hydrogen atoms is one of the simplest examples.

In fact, though, from ultimate simple elements indefinitely complex structures, with indefinitely complex modal roles, can be built up. In a remarkable paper 'The Mathematical Structure of the World: The World as a Graph' Randall Dipert (1997) proposes an even simpler metaphysical scheme than mine. His idea is that the world is 'a single, large structure induced by a single, two-place, symmetrical relation,…' (p.329). The particulars which this structure links together are simple and lack any non-relational (intrinsic) property. They are represented as dots, and the relation as a line that links the dots. There will be monadic properties, but they will all be structural properties of complex entities – a number of dots connected together by lines in a certain way. I am not entirely happy with the idea of ultimate particulars that lack non-relational properties. (It would allow the possibility of 'dots' linked to nothing: truly bare particulars, and I am uneasy about this.) But Dipert's scheme (the full sweep of which cannot be presented here) is an interesting one. And metaphysical possibility in his scheme could be represented easily enough. It would just be a matter of 'adding' or 'subtracting' lines and/or dots, marked to indicate that these additions and subtractions are mere possibilities. If the null modal role is desired, the adding and subtracting could be perfectly promiscuous.

But the point of especial interest for me here is Dipert's claim that such a one-relation (one universal) theory will, plausibly, generate indefinitely complex structures which might serve to explain the whole structure of the world. He says 'Even with small graphs [dot and line structures] – say, graphs with just vertices – the diversity of structures that are in some sense distinct is dazzling and, indeed, largely uncontemplated.' (p.343.) A graph with forty vertices, he says, contains 2^{40} subgraphs (p.352).
Asymmetrical and non-symmetrical relations 'emerge' easily enough, though the point is that they are not really emergent. Determinable/determinate relations, quantities and so forth should present no difficulties. None of this is an argument for Dipert's scheme, or mine which I now hope you will think is rather conservative. But it does seem to meet adequately the argument from the complexity of the world as we know it, and from the complex modal role that so many entities exhibit.

What, finally, if there are no simple particulars, properties and relations? What shall we say if the world is a matter of structures all the way down? That poses problems for the null modal force hypothesis, or at least problems concerning how to formulate it. But let us try this. We shall want there to exist a decomposition of the particulars that make up the world (itself a particular) that is exhaustive and non-overlapping. These are the particulars that will appear in the column headings. For the universals we shall want something similar, though it is a little harder to see how to get it. We can begin by saying that each universal must be instantiated at least once. But each universal will be a structure of some sort (by the assumption of infinite complexity), and because structures can be embedded in structures, one would expect a tremendous amount of repetition. Can we demand that there be no overlap of this sort, and yet instantiate every universal, property or relation, that there is? Perhaps we can, with some universals being instantiated only as *conjunctions* of the ticked intersections of the chart. They would supervene on the chart rather than having a row to themselves. (The same would hold for particulars that contained one or more of the particulars found in the columns.)

If there exists a column and a row of this nature, and if, further, the modal role of the universals in the resulting spread-sheet is in each case the null role, then this is similar to the hypothesised null role in the atomist world already sketched. But though necessary, the satisfaction of this condition is not sufficient in the bottomless world. For as we go down the *inner* complexity in the universals in the rows, is it ruled out that necessities of the coexistence or of exclusion do not exist? If they do, the world is not a modally null world.

We need a much more stringent condition. Suppose we enlarge our spread-sheet by analysing one of the universals into, say, a conjunction of universals. (I take this case only because it is the simplest case to think about.) Universals in the enlarged spread-sheet must also have the null modal role. And so on for ever for every universal and every particular. I hope that then the modally null hypothesis has been defined for a non-atomist as well as an atomist world[6].

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